Claims

1. A method for determining the optical temporal response of a medium to a short optical pulse excitation, said method comprising the following steps:

   (a) sending light through said medium, wherein said light comprises spectral frequencies which make up the Fourier transform of said short pulse to be emulated;

   (b) detecting spectral components of said light exiting said medium;

   (c) determining the relative amplitude and phase change of each of said spectral components with respect to that of said illuminating light source;

   (d) obtaining from said relative amplitude and phase change the spectral response of said medium;

   (e) computationally performing an inverse Fourier transform on said spectral response; and

   (f) obtaining the temporal response of said medium to said emulated short pulse from said inverse Fourier Transform.

2. A method according to claim 1, where the light is a CW.

3. A method according to claim 1, where the light is modulated.

4. A method according to claim 1, wherein the light comprises substantially all of the spectral frequencies which make up the Fourier transform of the short pulse to be emulated.

5. A method according to claim 1, wherein the light comprises substantially less than all of the spectral frequencies which make up the Fourier transform of the short pulse to be emulated.

6. A method according to claim 1, wherein the light has a carrier frequency, which is scanned over time; and the relative amplitude and phase change are determined for each carrier frequency.

7. A method according to claim 1, wherein the light consists of a broad spectral bandwidth and each of the spectral components of the output of said light exiting the medium are detected.

8. A method according to claim 1, wherein the light is detected either at a point, along a line, or over a two-dimensional area.

9. A method according to claim 1, wherein the light transmitted through the medium is detected.

10. A method according to claim 1, wherein the light reflected back from the medium is detected.

11. A method according to claim 1, wherein the light, which exits the medium at any angle with respect to the illumination path, is detected.

12. A method according to claims 1, wherein at least one object is embedded within the medium.

13. A method according to claim 12, wherein the at least one object is detected.

14. A method according to claim 12, wherein the at least one object is imaged.

15. A method according to claim 12 where the at least one object comprises a cancerous growth and the medium comprises a segment of the human body.

16. A method according to claim 1, wherein the medium comprises discrete layers.

17. A method according to claim 1, wherein the 'first light' response, which is indicative of the position and shape of said object or objects embedded in an optically turbid medium and/or obstructed by other objects, which are at least partially transparent, is determined from the optical temporal response.

18. A method according to claim 1, wherein a specific segment of the temporal response, which is indicative of the position and shape of the object or objects embedded in an optically turbid medium and/or obstructed by other objects, which are at least partially transparent, is determined from said optical temporal response

19. A system for determining the optical temporal response of a medium to a short optical pulse excitation, said system comprising the following components:

- a tunable laser;
- an RF oscillator;
- modulating means;
- detecting means;
- an optically scattering medium;
- electronic processing means; and
- optional optical elements means.